

WHAT IS CLAIMED IS:

1. An isolated synthetic peptide or polypeptide comprising a domain which specifically binds a nucleic acid sequence and a domain which specifically binds a metal which is hydrolytic or redox active, wherein the domain which specifically binds the metal is within the domain which specifically binds the nucleic acid sequence.
2. The peptide or polypeptide of claim 1 which comprises the amino acid sequence TERRRQQLDKDGDGTIDEREIKIHFQNKRAKIK (SEQ ID NO:2), or a catalytically active portion thereof.
3. The peptide or polypeptide of claim 1 which comprises the amino acid sequence TERRRFDKQNGYIGAADLRHVKIWFQNKRAKIK (SEQ ID NO:3), or a catalytically active portion thereof.
4. The peptide or polypeptide of claim 1 which comprises at least 20 residues.
5. The peptide or polypeptide of claim 1 which comprises a consensus EF-Hand sequence.
6. The peptide or polypeptide of claim 1 wherein the domain which specifically binds the nucleic acid sequence is a domain from a transcription factor.
7. The peptide or polypeptide of claim 1 wherein the domain which specifically binds the nucleic acid sequence comprises a helix-turn-helix motif, a relaxed helix-turn-helix motif, a winged helix-turn-helix motif, a helix-loop-strand motif, or a hormone receptor motif.

8. The peptide or polypeptide of claim 1 which binds dsDNA, dsRNA, ssDNA, ssRNA, A-DNA, B-DNA, or Z-DNA.
9. The peptide or polypeptide of claim 6 wherein the transcription factor is engrailed.
10. The peptide or polypeptide of claim 1 wherein the domain which specifically binds the nucleic acid sequence is a homeodomain.
11. The peptide or polypeptide of claim 6 wherein the transcription factor comprises a helix-turn-helix domain.
12. The peptide or polypeptide of claim 7 which comprises alpha-helices 2 and 3 of a helix-turn-helix motif.
13. The peptide or polypeptide of claim 1 wherein the hydrolytic metal is a transition metal.
14. The peptide or polypeptide of claim 1 which binds Zn(II), Cd(II), Ce(II), Cr(IV), Fe(III), Co(III), Mn(II) and Cu(II).
15. The peptide or polypeptide of claim 1 which binds a lanthanide.
16. The peptide or polypeptide of claim 1 which binds Ca(II) or Mg(II).
17. The peptide or polypeptide of claim 1 which binds Eu(III).
18. The peptide or polypeptide of claim 1 further comprising a protein transport domain.

19. An isolated nucleic acid molecule comprising a nucleic acid segment which encodes the peptide or polypeptide of claim 1, or a sequence complementary thereto.
20. An expression cassette comprising the nucleic acid molecule of claim 19 which is operably linked to a promoter functional in a host cell.
21. A host cell comprising the expression cassette of claim 20.
22. The host cell of claim 21 wherein the host cell is a prokaryotic cell.
23. The host cell of claim 21 wherein the host cell is a eukaryotic cell.
24. The host cell of claim 21 wherein the host cell is a plant cell.
25. A vector comprising the expression of cassette of claim 20.
26. A method to identify a synthetic endonuclease comprising:
 - a) identifying a secondary structure in a first amino acid sequence that binds to a specific nucleic acid sequence which has geometrical similarity to the secondary structure of a second amino acid sequence that binds a metal; and
 - b) identifying a third amino acid sequence that comprises at least a portion of the first amino acid sequence and at least a portion of the second amino acid sequence to yield a synthetic endonuclease which specifically binds the specific nucleic acid sequence and specifically binds the metal.
27. A method of using a synthetic endonuclease specific for a particular nucleic acid sequence comprising: contacting a sample comprising isolated nucleic

acid with an amount of the peptide or polypeptide of claim 1 effective to cleave at least one nucleic acid sequence in the sample.

28. A method to detect the presence of a nucleic acid sequence in a sample comprising:
 - a) contacting a sample comprising nucleic acid suspected of containing a nucleic acid sequence recognized by the peptide or polypeptide of claim 1, with the peptide or polypeptide of claim 1; and
 - b) determining or detecting whether the peptide or polypeptide cleaves the nucleic acid sequence.
29. The method of claim 28 wherein the detection or determination is by gel electrophoresis.
30. The peptide or polypeptide of claim 1 which comprises the amino acid sequence TERRRFRVFDKDGNGYISAAEKIWFQNKEAKIK (SEQ ID NO:4), or a catalytically active portion thereof.
31. The peptide or polypeptide of claim 1 which comprises the amino acid sequence TRRRRFSLFDKDGDTITTKEEVWFQNRRMKWK (SEQ ID NO:5), or a catalytically active portion thereof.
32. The peptide or polypeptide of claim 1 which comprises the amino acid sequence DEKRPRTAFSGEQLARLKREFNENRYLTERRRLRVFDKDGNGFISAAEKIWFQNKRAKIKKST (SEQ ID NO:6), or a catalytically active portion thereof.